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| 10/735,155 | 12/12/2003 | Kazuyoshi Serizawa | 16869N-102200US | 3512 |

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| EXAMINER | |
|---|---|
| GU, SHAWN X | |

| ART UNIT | PAPER NUMBER |
|---|---|
| 2189 | |

DATE MAILED: 07/12/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 10/735,155 | SERIZAWA ET AL. | |
| | Examiner | Art Unit | |
| | Shawn Gu | 2189 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *15 May 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1-20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,2,4-6 and 8-20* is/are rejected.

7)☒ Claim(s) *3 and 7* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☒ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

## DETAILED ACTION

### *Response to Amendment*

1. This final Office action is in response to the amendment filed on 15 May 2006. Claims 1-20 are pending. All objections and rejections not repeated below are withdrawn.

### *Specification*

2. Applicant is reminded of the proper language and format for an abstract of the disclosure.

The abstract should be in narrative form and generally limited to a single paragraph on a separate sheet within the range of 50 to 150 words. It is important that the abstract not exceed 150 words in length since the space provided for the abstract on the computer tape used by the printer is limited. The form and legal phraseology often used in patent claims, such as "means" and "said," should be avoided. The abstract should describe the disclosure sufficiently to assist readers in deciding whether there is a need for consulting the full patent text for details.

The language should be clear and concise and should not repeat information given in the title. It should avoid using phrases which can be implied, such as, "The disclosure concerns," "The disclosure defined by this invention," "The disclosure describes," etc.

3. The abstract of the disclosure is objected to because it contains more than 150 words. Correction is required. See MPEP § 608.01(b).

### *Claim Objections*

4. Claims 15-17 are objected to because of the following informalities:

Claim 15 contains possible typographical or grammatical errors "volumes that becomes a real area" in line 8.

All dependent claims are objected to as having the same deficiencies as the claims they depend from. Appropriate correction is required.

***Claim Rejections - 35 USC § 112***

5. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

6. Claims 9-14 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 9 recites the limitation "the storage area" in line 6. There is insufficient antecedent basis for this limitation in the claim.

Claim 14 recites the limitation "another storage area" in line 4, which indicates at least a first storage area. However, there is no first storage area previously recited in the claim.

All dependent claims are rejected as having the same deficiencies as the claims they depend from. Appropriate correction is required.

***Claim Rejections - 35 USC § 103***

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

8. Claims 1, 2, 4-6, 8, 9, 12, and 14-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yamamoto et al. [US 2002/0144076 A1] (hereinafter "Yamamoto"), in further view of McBrearty et al. [US 6526492 B1] (hereinafter "McBrearty").

Per claims 1, 6, 9, 15, 18, and 20, Yamamoto teaches a virtualization apparatus (Fig 1, 142 LVM) that allocates logical volumes (the partial storage areas/regions for stroing data such as database tables and FSs, that form the LVs, see Page 1, Paragraph [0006]-[0008]) of a storage device has (Page 1, Paragraph [0006]), forms a plurality of virtual volumes (LVs, see Page 1, Paragraph [0007]) from the logical volumes, and processes input-output request sent from a host processor to one of the virtual volumes (Page 2, Paragraph [0040]), comprising:

a configuration change control program for changing a configuration of associating the virtual volume with the logical volumes that becomes a real area of the storage device (Page 2, Paragraphs [0040]-[0042]); and

a first processor that executes the configuration change control program (Fig 1 and Fig 9, 101 CPU), wherein the program includes:

means for requesting an input-output request temporary block (Fig 6, 601; Page 1, [0016]; Page 4, [0065]; Page 8, [0154]) to another virtualization apparatus (Fig 1, combination of 141 LV-PV mapping information and 111 Storage Control Processor) before changing the configuration of associating the virtual volume with the logical volumes that becomes the real area of the storage device (Fig 6, step 601 is before 606);

means for allowing the other virtualization apparatus that received the request to complete all input-output requests received from the host processor that are being processed, shifting to a state of temporarily holding subsequently received input-output requests from the host processors, and returning a completion report (Fig 6, 601; Page 1, [0016]; Page 4, [0065]; Page 8, [0154]; the block is done by taking the logical volume offline and dismounting the device in an UNIX operating system, therefore the input-output already in processing should be finished before dismount, and some kind of report/acknowledgement must be sent back to the operating system);

means for instructing, to the other virtualization apparatus, an allocation change of the logical volumes to the virtual volume when receiving the completion report from the other virtualization apparatus (Fig 6, 606; Page 4, [0072]);

means for receiving the completion report of the allocation change from the other virtualization apparatus (Fig 6, 607; Page 4, [0072]; updating the mapping information and put the logical volume back online to restore operating is a report of allocation change completion); and

means for sending an instruction to the other virtualization apparatus for releasing the input-output request that are being temporarily held (Page 4, [0073]).

Although Yamamoto does not specifically disclose that temporarily blocking the input-output request from a host processor involves holding the requests, McBrearty teaches a similar system wherein a virtualization apparatus (LVM) holds all incoming I/O requests to the logical volumes before an allocation change, and waits for all the I/O requests already in process to complete before the allocation change, so that the disks are closed and reopened without reserve (Col 4, Lines 1-20). Therefore it would have been obvious to one ordinarily skilled in the art at the time of the Applicant's invention that McBrearty's teaching can be combined with that of Yamamoto's in order to allow all outstanding I/O requests to complete, so that the disks can be closed and reopened during allocation change without reserve.

Although Yamamoto does not teach a plurality of host processors, multi-processor systems are already well known in the art to provide the advantages of fault tolerance and increased performance over single processor systems. McBrearty teaches a plurality of host processors (see Fig. 1, nodes A-B, and Col.2, Ln.55-65) that issue I/O requests to the storage system 106. Therefore it would have been obvious to one ordinarily skilled in the art at the time of the Applicant's invention that McBrearty's

plurality of host processors can be combined with Yamamoto's system to provide fault tolerance and increased performed.

It is also clear that claims 1, 6, 18 and 20 are already substantially disclosed as described above, but Yamamoto does not specifically disclose a plurality of virtualization apparatuses. However, McBrearty further teaches a plurality of virtualization apparatuses (Fig 1, 102 node_A and 104_node_B; Col 1, Lines 29-44; each processing node comprises an UNIX operations system which serves as a virtualization apparatus), which form a multi-processing or distributed computing system as opposed to Yamamoto's single processor system. Therefore, it would have been obvious to one ordinarily skilled that McBrearty's teaching can be combined with that of Yamamoto's, in order to manufacture a multi-processing or distributed computing system which allows more computing capability and reliability than Yamamoto's single processor system.

Per claim 2, Yamamoto further teaches a table storing configuration information that associates the virtual volume with the logical volumes that becomes a real area of the storage device is prepared in a memory in advance (Fig 1, 141 LV-PV mapping information; Fig 3, 310), and

when the instruction of an allocation change is sent (Fig 1, Transfer Request), difference information of the configuration information (Fig 1 and Fig 5, 145 Data Transfer Region Information) is sent, and the virtualization apparatus changes the

configuration information on a relevant entry of the table (Fig 2, LV-PV Mapping Change; Fig 6, 606).

Per claim 4, Yamamoto further teaches that whether the input-output is held temporarily or not is controlled aiming at an address range including a location where the allocation is changed on the virtual volume (Fig 5, 501 Transfer source range information and 502 Transfer destination range information; Fig 6, 601, Fig 10, 1001 and 1007).

Per claims 5 and 17, Yamamoto further teaches a copy control unit for copying data from logical volumes originally allocated to a virtual volume to other logical volumes that are subsequently allocated to the virtual volume. (Fig 1 and Fig 9, Copy Operation; Fig 6, 604 and 605; in Fig 6, the step to change configuration information, or step 606 comes after 604 and 605; Page 4, Paragraphs [0080]-[0083]).

It is also clear that the method of claim 5 is performed by the copy control unit of claim 17.

Per claims 8 and 19, Yamamoto, in combination with McBrearty already substantially discloses the claims as described above, but neither references teaches a management console comprising an input unit and a display unit. However, McBrearty teaches that the virtualization apparatus comprises a UNIX operating system (Col 1, Lines 29-44), and it would have been obvious to one ordinarily skilled in the art at the

time of the Applicant's invention that a UNIX operating system is usually implemented on a computing platform with an input unit (usually a keyboard an a mouse), and a display unit (the terminal screen).

Per claim 12, Yamamoto in combination with McBrearty already substantially discloses the claim as described above, but neither references particularly point out performing arbitration processing to limit the first processor. However, since Yamamoto in combination with McBrearty teaches a multi-processing system as described above, and it would have obvious to one ordinarily skilled in the art at the time of the Applicant's invention that some form of arbitration must be performed on the processors (McBrearty, Fig 1, 102 node_A and 104 node_B) which share the same bus 108 and storage device 106 in order to resolve contention for the common resources.

Per claim 14, Yamamoto already substantially discloses the claim as described above in claims 5, 9 and 17, and further discloses a copy progress table (Fig 5, 145 Data transfer region information) that manages a progress status (Fig 5, 503 Progress pointer and 504 Synchronization status) of the copy processing of the data using the copy processing program.

Per claim 16, it is clear the claim is already substantially disclosed by claims 9 and 15 as described above.

### *Allowable Subject Matter*

9. Claims 3 and 7 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter:

Claim 3 discloses removing a virtualization apparatus that did not receive the completion report of the input-output processing, and not changing the allocation of the logical volumes. The limitation is not described in any of the references cited by the Examiner.

Claim 7 includes a limitation for a difference information table that records a difference before and after a change of the configuration information, which is not disclosed by any references cited by the Examiner. Claim 7 further discloses the configuration change controller sending the difference information to the virtualization apparatus when sending the instruction of the allocation change of the logical volumes.

### *Response to Arguments*

10. Applicant's arguments filed on 15 May 2006 with respect to claims 1-20 have been considered but are moot in view of the new ground(s) of rejection. The newly

added limitations are taught by Yamamoto [US 2002/0144076 A1], in further view of McBrearty [US 6526492 B1] as set forth above.

In response to the Applicant's first argument (see Remarks, page 11, last paragraph), the plurality of host processors is described in claims 1, 6, 9, 15, 18 and 20's rejection as set forth above. The Examiner also disagrees with the Applicant's remark that Yamamoto's LVM does not teach processing I/O processing from the host processors. The LVM in Yamamoto manages (creates, deletes, and resizes) the LVs which are mapped to the PVs, therefore the LVs are parts of the LVM. The I/O requests from the processors must through the LVs first before actual processing is performed on the physical storage devices (see page 1, para.[0006]-[0008]). Therefore it is clear that Yamamoto's LVM processes I/O requests from the host processors.

The Examiner also notes the Applicant's admission that "McBearty ... does mention a logical volume manager".

In response to the Applicant second argument (see Remarks, page 12, paragraphs 1 and 2), the Applicant is self-contradicting by claiming "McBrearty does not show an LVM", when by the Applicant's own admission in the first argument that McBrearty indeed teaches a LVM (see McBrearty, Fig.2 and 3, Col.1, Ln. 30-45).

11. Applicant's amendment called for the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

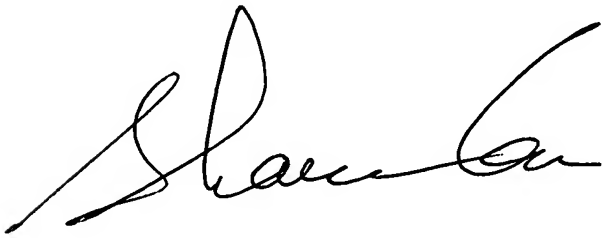
A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

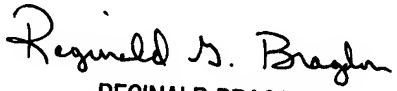
***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Shawn Gu whose telephone number is (571) 272-0703. The examiner can normally be reached on 9am-5pm, Monday through Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Reginald Bragdon can be reached on (571) 272-4204. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).





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30 June 2006